Sheet 9 Physics.

1) $P = \frac{2}{R}\gamma$ $\quad \gamma = 0.04\ N/M \quad R = 0.05\ M$

$$P = \frac{2}{R}\gamma = 1.6\ N/M^2 = 1.6\ Pa.$$

2) Volume of a sphere is $= \frac{4}{3}\pi R^3$

$V = 2.5$ litres $\quad$ Volume of one alveoli $= \frac{2.5}{3\times10^8} =$

$8.33\times10^{-9}\ L$ each.

1 litre $= 0.001\ M^3$

So volume $= 8.33\times10^{-12}\ m^3$

$8.33\times10^{-12} = \frac{4}{3}\pi R^3 \quad R = 1.257\times10^{-4}$

$P = \frac{2}{R}\gamma \quad P = 397.55\ Pa.$

3)

$h = \frac{2T}{\rho g} = \frac{2\gamma}{\rho g} \Rightarrow$ Capillary action.

density ρ of water $= 1000\ kg/m^3 \quad g \Rightarrow$ gravity $\quad r \Rightarrow$ radius

$$h = \frac{2\times0.072}{1000\times\frac{0.5\times10^{-9}}{2}\times9.81} = 58.73\times10^3\ m$$

4.

Work = $PV^{\frac{1}{2}}$ = Pressure x Volume.

80ml $\Rightarrow 8\times10^{-5}m^3$ 120mmHg $\Rightarrow 16\times10^{3}Pa$

25 mmHg $\Rightarrow 3.33\times10^{3}Pa$

work done during Systole = $16\times10^{3} \times 8\times10^{-5} = 1.28$ Nm.

work done during pulmonary phase = $3.33\times10^{3} \times 8\times10^{-5} = 0.266$ Nm

Total work done = 1.546 Nm
per pump.

72 pump 1 min

72x60x24 pump 1 day
103680 pump

Total work done daily = 160.345×10^{3} Nm.

5) K.E = P x V

max P = 3.33×10^{3} Pa Volume = $8\times10^{-5}m^3$

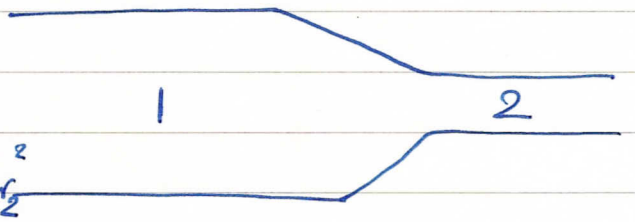
= 0.266 Nm

6)

	Tension = P x Radius
Typical Artery	159.98
	59.99
Small Capillary	$0.0239 = 23.99\times10^{-3}$
Small vein	0.399
Vena Cava	19.99

8)

$$U_1 d_1^2 = U_2 d_2^2$$



Speed$_1$ x diameter$_1^2$ = Speed$_2$ x diameter$_2^2$

$V \times (0.03)^2 = 50 \times (0.02)^2$ b) yes at constricted area.

$V = 112.5$ cm/s

9) ??

10) $U_2 = \frac{A_1 U_1}{A_2} = \frac{2.5 \times 10^{-5} \cdot V_1}{1 \times 10^{-8}}$

$P = \frac{F}{A} = \frac{2}{2.5 \times 10^{-5}} = 80 \times 10^3$ Pa.

$P = \frac{1}{2} \rho V^2$ $\rho = 1000$ = density of water.

$80 \times 10^3 = \frac{1}{2} \times 1000 \times V^2$ $V = 12.65$ during barrel stage

$V_2 = \frac{2.5 \times 10^{-5} \cdot 12.65}{1 \times 10^{-8}} = 31.62 \times 10^3$ m/s

11) $P_1 - P_2 = \rho g h$

Pressure of air = $\frac{1}{2} \rho V^2 = \frac{1}{2} \times 1.25 V^2 = 0.625 V^2$

$0.625 V^2 - P_{atm} = 13600 \times 9 \times \frac{5}{700}$ $V = 415.68$

$P_{atm} \downarrow$

101325 Pa

12) needs lecture

13) by 29.289 %

14)

15) → needs lecture

16) a) $\gamma = \frac{F}{2\pi \times 2r} = \frac{F}{4\pi r}$

b) $\gamma = \frac{8.40 \times 10^{-3}}{4 \times \pi \times \frac{2.8}{100}} = 0.0238 \text{ N/m}$

17)

$A_1V_1 = A_2V_2 + A_3V_3 + \ldots\ldots A_nV_n$

$\pi (1.2)^2 \times 40 = X((4\times10^{-4})^2 . (5\times10^{-4}) . \pi)$

$X = 288 \times 10^6 = 288 \text{ Million.}$

18) $A_1V_1 = A_2V_2$

$30 \times 3 = 600 \times V \quad V = 0.15$ at cappillaries.

$600 \times 0.15 = 5 \times A \quad A = 18$ at venaCava.